

Claims

- [c1] A unitary portable surface cleaning apparatus, comprising:
- a fluid dispensing system including at least one fluid supply tank,
 - a liquid dispenser connected to the fluid supply tank for applying a liquid cleaning fluid to a surface to be cleaned;
 - a fluid recovery tank for holding recovered fluid;
 - a suction nozzle;
 - a working air conduit extending between the recovery tank and the suction nozzle; and
 - a vacuum source in fluid communication with the recovery tank and the suction nozzle for generating a flow of working air from the suction nozzle through the working air conduit and to the recovery tank to thereby recover fluid from the surface to be cleaned through the suction nozzle and working air conduit and into the recovery tank;
- the improvement which comprises:
- a vapor generator connected to a source of liquid and to a vapor dispenser for dispensing a heated vapor to the surface to be cleaned.
- [c2] A portable surface cleaning apparatus according to claim 1 wherein the vapor generator is associated with the fluid dispensing system and is adapted to heat at least a portion of the cleaning fluid above its boiling point to form the heated vapor in the vapor generator.

- [c3] A portable surface cleaning apparatus according to claim 2 and further comprising a control element associated with the vapor generator for selectively controlling the delivery of heated vapor to the surface to be cleaned.
- [c4] A portable surface cleaning apparatus according to claim 3 wherein the control element includes a valve having an inlet connected to the at least one fluid supply tank and a pair of outlets, one of the outlets is connected to the vapor generator and the other of the outlets is connected to the liquid dispenser, the valve is adapted to selectively control the flow of cleaning fluid from the at least one fluid supply tank to the vapor generator and to the liquid dispenser.
- [c5] A portable surface cleaning apparatus according to claim 4 and further comprising a canister and wherein the at least one fluid supply tank, the recovery tank and the vacuum source are mounted in the canister; and the working air conduit comprises a wand and a hose that are connected to the vacuum source.
- [c6] A portable surface cleaning apparatus according to claim 5 wherein the valve is mounted on the wand.
- [c7] A portable surface cleaning apparatus according to claim 6 wherein the wand has a handle and the valve is mounted on the handle.
- [c8] A portable surface cleaning apparatus according to claim 7

wherein the control element further includes a control knob that is mounted to the handle and is connected to the valve.

[c9] A portable surface cleaning apparatus according to claim 8 and further comprising a fluid control valve for selectively controlling the flow of cleaning fluid to the valve inlet.

[c10] A portable surface cleaning apparatus according to claim 9 and further comprising a trigger pivotally mounted on the handle and connected to the fluid control valve for selective operation thereof.

[c11] A portable surface cleaning apparatus according to claim 6 wherein the valve is mounted to a lower portion of the wand.

[c12] A portable surface cleaning apparatus according to claim 11 and further comprising a control knob mounted to a lower portion of the wand and connected to the valve for control thereof.

[c13] A portable surface cleaning apparatus according to claim 2 wherein the vapor generator includes an electrical heating element.

[c14] A portable surface cleaning apparatus according to claim 13 wherein the vapor generator and the vacuum source are connected to a common electrical input and are adapted to be powered by a common power source.

[c15] A portable surface cleaning apparatus according to claim 14

wherein the power source is a standard 120 volt line.

- [c16] A portable surface cleaning apparatus according to claim 15 and further comprising a switch between the power source, the vacuum source and the vapor generator for alternating power to the heating element and to the vacuum source.
- [c17] A portable surface cleaning apparatus according to claim 2 and further comprising a base that is adapted to move across a surface to be cleaned and a handle pivotally mounted to the base for manipulating the base across the surface to be cleaned, and wherein the fluid dispensing system, the recovery tank, the fluid dispenser, the suction nozzle, the vacuum source and the vapor generator are mounted individually to one of the handle and the base.
- [c18] A portable surface cleaning apparatus according to claim 17 wherein the valve, the liquid dispenser and the vapor dispenser are mounted on the base.
- [c19] A portable surface cleaning apparatus according to claim 18 and further comprising a pump between the at least one fluid supply tank and the valve inlet.
- [c20] A portable surface cleaning apparatus according to claim 1 and further comprising a heater associated with the fluid dispensing system for heating at least a portion of the cleaning fluid before it is applied to the surface to be cleaned.

- [c21] A portable surface cleaning apparatus according to claim 20 and further comprising a base that is adapted to move across a surface to be cleaned and a handle pivotally mounted to the base for manipulating the base across the surface to be cleaned, and wherein the fluid dispensing system, the recovery tank, the fluid dispenser, the suction nozzle, the vacuum source, the vapor generator and the heater are mounted individually to one of the handle and the base.
- [c22] A portable surface cleaning apparatus according to claim 21 wherein the valve, the liquid dispenser and the vapor dispenser are mounted on the base.
- [c23] A portable surface cleaning apparatus according to claim 22 wherein the heater is associated with the at least one fluid supply tank and the vapor generator is in the at least one fluid supply tank, whereby the vapor generated in the at least one fluid supply tank forms a vapor pump for dispensing heated liquid from the fluid supply tank to the liquid dispenser.
- [c24] A portable surface cleaning apparatus according to claim 23 wherein the fluid dispensing system further includes a control element associated with the vapor generator for selectively controlling the delivery of heated vapor to the surface to be cleaned.
- [c25] A portable surface cleaning apparatus according to claim 24

wherein the vapor is aqueous.

- [c26] A portable surface cleaning apparatus according to claim 20 wherein the heater is an electrical heating element.
- [c27] A portable surface cleaning apparatus according to claim 20 wherein the heater, the vapor generator and the vacuum source are connected to a common electrical input and are adapted to be powered by a common power source.
- [c28] A portable surface cleaning apparatus according to claim 27 wherein the power source is a standard 120 volt line.
- [c29] A portable surface cleaning apparatus according to claim 28 and further comprising a switch between the power source, the vacuum source, the vapor generator and the heater for alternating power to the heating element, the vapor generator and to the vacuum source.
- [c30] A portable surface cleaning apparatus according to claim 20 and further comprising a switch between the power source, the vacuum source, the vapor generator and the heater for alternating power to the heater, the vapor generator and to the vacuum source.
- [c31] A portable surface cleaning apparatus according to claim 30 wherein the heater is an electrical heating element.
- [c32] A portable surface cleaning apparatus according to claim 1 and

further comprising a base that is adapted to move across a surface to be cleaned and a handle pivotally mounted to the base for manipulating the base across the surface to be cleaned, and wherein the fluid dispensing system, the recovery tank, the fluid dispenser, the suction nozzle and the vacuum source are individually mounted to one of the handle and the base; and wherein an above floor hose is attached at one end to the base, a wand is mounted to another end of the hose, and the vapor generator is mounted to the wand for pre-treating the surface to be cleaned with the heated vapor.

[c33] A portable surface cleaning apparatus according to claim 32 and further comprising a heater associated with the fluid dispensing system for heating at least a portion of the cleaning fluid before it is applied to the surface to be cleaned.

[c34] A portable surface cleaning apparatus according to claim 1 wherein the fluid dispensing system includes a valve having an inlet connected to the at least one fluid supply tank and having a first outlet connected to the vapor generator and a second outlet connected to the liquid dispenser, whereby the valve can selectively direct cleaning fluid to the vapor generator, to the liquid dispenser, or to a combination thereof for application to the surface to be cleaned.

[c35] A portable surface cleaning apparatus according to claim 1 wherein the fluid dispensing system further comprises a pump to

deliver the cleaning fluid to the surface to be cleaned at the predetermined rate.

- [c36] A portable surface cleaning apparatus according to claim 1 wherein the fluid dispensing system further includes a control element associated with the vapor generator for selectively controlling the delivery of heated vapor to the surface to be cleaned.
- [c37] A portable surface cleaning apparatus according to claim 1 wherein the vapor is aqueous.
- [c38] A portable surface cleaning apparatus according to claim 1 wherein a vapor conduit is provided between the vapor generator and the vapor dispenser, and the fluid dispensing system includes a fluid conduit between the at least one fluid supply tank and the fluid dispenser, and the fluid conduit passes through the vapor conduit in heat exchange relationship therewith for heating the cleaning fluid in the fluid conduit.
- [c39] A portable surface cleaning apparatus according to claim 37 and further comprising a controllable valve between the vapor generator and the vapor conduit for controlling the temperature of the cleaning fluid in heat exchange with the vapor conduit.
- [c40] A portable surface cleaning apparatus according to claim 1 and further comprising a base that is adapted to move across a surface to be cleaned and a handle pivotally mounted to the base

for manipulating the base across the surface to be cleaned, and wherein the fluid dispensing system, the recovery tank, the fluid dispenser, the suction nozzle, the vacuum source and the vapor generator are mounted individually to one of the handle and the base.

- [c41] A unitary portable surface cleaning apparatus, comprising:
- a fluid dispensing system including at least one fluid supply tank, a liquid dispensing nozzle connected to the fluid supply tank through a fluid supply conduit for applying a cleaning fluid to a surface to be cleaned at a predetermined rate;
 - a fluid recovery tank for holding recovered fluid;
 - a suction nozzle;
 - a working air conduit extending between the recovery tank and the suction nozzle;
 - a vacuum source in fluid communication with the recovery tank for generating a flow of working air from the suction nozzle through the working air conduit and to the recovery tank to thereby recover fluid from the surface to be cleaned through the suction nozzle and working air conduit and into the recovery tank;
 - a heating element associated with the fluid dispensing system for heating at least a portion of the cleaning fluid before it is applied to the surface to be cleaned;
 - a movably mounted agitator adapted to agitate the surface to be

cleaned;

an agitator motor in driving relationship to the agitator; and

a power source connected to the heating element, the agitator motor and the vacuum source;

the improvement which comprises:

a controller between the power source, the vacuum source, the agitator motor and the heating element for individually controlling power to the heating element, the agitator motor and to the vacuum source.

[c42] A portable surface cleaning apparatus according to claim 40 and further comprising a vapor generator for dispensing a heated vapor to the surface to be cleaned.

[c43] A portable surface cleaning apparatus according to claim 41 wherein the power source is a standard 120 volt line.

[c44] A unitary portable surface cleaning apparatus, comprising:
a fluid dispensing system including at least one fluid supply tank,
a liquid dispensing nozzle connected to the fluid supply tank through a fluid supply conduit for applying a cleaning fluid to a surface to be cleaned at a predetermined rate;
a fluid recovery tank for holding recovered fluid;
a suction nozzle;
a working air conduit extending between the recovery tank and the suction nozzle;
a vacuum source in fluid communication with the recovery tank

for generating a flow of working air from the suction nozzle through the working air conduit and to the recovery tank to thereby recover fluid from the surface to be cleaned through the suction nozzle and working air conduit and into the recovery tank; and

at least one heater associated with the fluid dispensing system for heating at least a portion of the cleaning fluid before it is applied to the surface to be cleaned; and

the improvement which comprises:

the at least one heater is adapted to heat a first portion of the cleaning fluid to a temperature below the boiling point and to heat a second portion of the cleaning fluid to a temperature above the vaporization temperature of the cleaning fluid;

a vapor dispenser connected to the at least one heater to dispense vaporized cleaning fluid to the surface to be cleaned; and

a mechanism to selectively deliver at least one of vaporized cleaning fluid and heated liquid cleaning fluid to the surface to be cleaned.

[c45] A unitary portable surface cleaning apparatus according to claim 44 wherein the mechanism includes a valve.

[c46] A method for cleaning a surface comprising the steps of:
heating the surface to be cleaned;
thereafter, applying a cleaning fluid to the heated surface to be

cleaned; and

recovering a soiled cleaning fluid from the surface to be cleaned.

- [c47] A method for cleaning a surface according to claim 46 and further comprising the scrubbing or agitating the surface to be cleaned between the applying and the recovering step.
- [c48] A method for cleaning a surface according to claim 47 wherein the recovery step includes the step of applying a suction force to the surface to be cleaned.
- [c49] A method for cleaning a surface according to claim 48 wherein the heating step includes the step of applying radiant energy to the surface to be cleaned.
- [c50] A method for cleaning a surface according to claim 48 wherein the heating step includes the step of applying a heated vapor to the surface to be cleaned.
- [c51] A method for cleaning a surface according to claim 50 wherein the heated vapor is air heated to an elevated temperature
- [c52] A method for cleaning a surface according to claim 50 wherein the heated vapor is a vaporized liquid.
- [c53] A method for cleaning a surface according to claim 52 wherein the vaporized liquid is water or an aqueous solution.
- [c54] A method for cleaning a surface according to claim 53 wherein the aqueous solution is a cleaning solution.

- [c55] A method for cleaning a surface according to claim 48 wherein the heating step includes the step of applying a liquid heated to an elevated temperature to the surface to be cleaned.
- [c56] A method for cleaning a surface according to claim 55 wherein the liquid that is heated is the cleaning solution.
- [c57] A method for cleaning a surface according to claim 48 wherein the heating step includes the step of heating the surface to be cleaned to a temperature in the range of 95-200°F
- [c58] A method for cleaning a surface according to claim 48 wherein the heating step includes the step of heating the surface to be cleaned to a temperature in the range of 100-130°F.
- [c59] A method for cleaning a surface according to claim 46 wherein the recovery step includes the step of applying a suction force to the surface to be cleaned.
- [c60] A method for cleaning a surface according to claim 46 wherein the heating step includes the step of applying radiant energy to the surface to be cleaned.
- [c61] A method for cleaning a surface according to claim 46 wherein the heating step includes the step of applying a heated vapor to the surface to be cleaned.
- [c62] A method for cleaning a surface according to claim 46 wherein the heated vapor is air heated to an elevated temperature

- [c63] A method for cleaning a surface according to claim 46 wherein the heated vapor is a vaporized liquid.
- [c64] A method for cleaning a surface according to claim 46 wherein the vaporized liquid is water or an aqueous solution.
- [c65] A method for cleaning a surface according to claim 64 wherein the aqueous solution is a cleaning solution.
- [c66] A method for cleaning a surface according to claim 46 wherein the heating step includes the step of applying a liquid heated to an elevated temperature to the surface to be cleaned.
- [c67] A method for cleaning a surface according to claim 66 wherein the liquid that is heated is the cleaning solution.
- [c68] A method for cleaning a surface according to claim 46 wherein the heating step includes the step of heating the surface to be cleaned to a temperature in the range of 95-200°F
- [c69] A method for cleaning a surface according to claim 46 wherein the heating step includes the step of heating the surface to be cleaned to a temperature in the range of 100-130°F.